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EXAMINER

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ART UNIT

PAPER NUMBER

2814

DATE MAILED:

07/24/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

## Office Action Summary

Application No.

09/259,145

Applicant(s)

PAN ET AL.

Examiner

Anh D. Mai

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

1) Responsive to communication(s) filed on 05 July 2001.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

4) Claim(s) 25,26,31-34,37-40 and 43-49 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 25,26,31-34,37-40 and 43-49 is/are rejected.

7) Claim(s) \_\_\_\_\_ is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on \_\_\_\_\_ is: a) approved b) disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some \* c) None of:

1. Certified copies of the priority documents have been received.

2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

1) Notice of References Cited (PTO-892) 4) Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.

2) Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) Notice of Informal Patent Application (PTO-152)

3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_. 6) Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Continued Examination***

1. The request filed on May 11, 2001 for a Continued Examination (RCE) based on parent Application No. 09/259,145 is acceptable. An action on the RCE follows.

### ***Response to Amendment***

2. The amendment filed November 28, 2000 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: "*free of field oxide structure*".

Applicant is required to cancel the new matter in the reply to this Office Action.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 25, 26, 31-34, 37-40 and 43-49 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There does not appear to be a written description of the claim limitation "*free of field oxide structures*" in the application as filed.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 25, 26, 31-34, 37-40 and 43-49 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are indefinite because applicants attempt to claim the invention by *excluding what the inventors did not invent* rather than distinctly and particularly pointing out what they did invent. *In re Schechter*, 205 F.2d 185, 98 USPQ 144 (CCPA 1953). MPEP 2173.05(i).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 25, 26 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tada (U.S. Patent No. 5,545,577) in view of Koike (5,874,325).

Tada teaches a pre-anneal intermediate structure in the formation of an isolation structure for a semiconductor device substantially as claimed including:

a semiconductor substrate (100) free of field oxide structures and having a first surface and a second surface, the first surface opposing the second surface; at least one p-well (3) and at least one n-well (2) on the substrate first surface;

at least one p-type area (5) within the at least one n-well;  
at least one n-type area (6) within the at least one p-well; and  
a substantially dopant-free, uninterrupted diffusion barrier layer over the substrate first surface. (See Fig. 2c and 3a, col. 6, ll. 3-32).

Thus, Tada is shown to teach all of the features of the claim with the exception of the substantially dopant-free barrier layer is formed extending over the substrate second surface.

However, Koike teaches a substantially dopant-free barrier layer (104) is formed extending over the substrate (101) first and second surface.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to form the substantially dopant-free barrier layer of Tada extending over the first and second surface as taught by Koike to prevent the second surface from oxidizing.

Further, the pre-anneal intermediate semiconductor substrate of Tada appears to be free of field oxide structures. (See Fig. 2c).

With respect to claim 26, the structure of Tada also includes an oxide layer (4) between the substrate first surface and the substantially dopant-free barrier layer.

With respect to claim 31, the substantially dopant-free barrier layer of Tada is silicon nitride.

6. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tada '577 and Koike '325 as applied to claim 25 above, and further in view of Shim et al. (U.S. Patent No. 5,846,596).

Tada and Koike teach all of the features of the claim with the exception of using silicon oxynitride for the substantially dopant-free barrier layer.

However, Shim teaches the oxidation resistant layer (130) comprising silicon oxynitride (130). (See col. 3, ll. 18-20).

It would have been obvious to one having ordinary skill in the art at the time of the invention to form the substantially dopant-free, uninterrupted diffusion barrier layer of Tada using silicon oxynitride as taught by Shim because it has an added advantage of oxidation resistance.

7. Claims 33, 34, 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tada '577 in view of Koike '325.

Tada teaches a pre-anneal intermediate structure in the formation of an isolation structure for a semiconductor device substantially as claimed including:

a semiconductor substrate (100) free of field oxide structures and having a first surface and a second surface, the first surface opposing the second surface;  
at least one p-well (3) and at least one n-well (2) on the substrate first surface;  
at least one doped area within at least one of the n-well and at least one of the p-well; and  
a substantially dopant-free, uninterrupted diffusion barrier layer over the substrate first surface. (See Fig. 2c, col. 6, ll. 3-32).

Thus, Tada is shown to teach all of the features of the claim with the exception of the substantially dopant-free barrier layer is formed extending over the substrate second surface.

However, Koike teaches a substantially dopant-free barrier layer (104) is formed extending over the substrate (101) first and second surface.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to form the substantially dopant-free barrier layer of Tada extending over the first and second surface as taught by Koike to prevent the second surface from oxidizing.

Further, the pre-anneal intermediate semiconductor substrate of Tada appears to be free of field oxide structures. (See Fig. 2c).

With respect to claim 34, the structure of Tada also includes an oxide layer (4) between the substrate first surface and the substantially dopant-free barrier layer.

With respect to claim 37, the substantially dopant-free barrier layer of Tada includes silicon nitride.

With respect to claim 38, the at least one doped area of Tada comprises an impurity selected from the group consisting of a n-type impurity and a p-type impurity.

8. Claims 39, 40 and 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tada '577 in view of Koike '325.

Tada teaches a pre-anneal intermediate structure in the formation of an isolation structure for a semiconductor device substantially as claimed including:

a semiconductor substrate (100) free of field oxide structures and having a first surface and a second surface, the first surface opposing the second surface;  
at least one doped area (2) on the substrate first surface;  
at least one second, differently doped area (5) within the at least one first doped area; and  
a substantially dopant-free, uninterrupted diffusion barrier layer over the substrate first surface. (See Fig. 2c, col. 6, ll. 3-32).

Thus, Tada is shown to teach all of the features of the claim with the exception of the substantially dopant-free barrier layer is formed extending over the substrate second surface.

However, Koike teaches a substantially dopant-free barrier layer (104) is formed extending over the substrate (101) first and second surface.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to form the substantially dopant-free barrier layer of Tada extending over the first and second surface as taught by Koike to prevent the second surface from oxidizing.

Further, the pre-anneal intermediate semiconductor substrate of Tada appears to be free of field oxide structures. (See Fig. 2c).

With respect to claim 40, the structure of Tada also includes an oxide layer (4) between the substrate first surface and the substantially dopant-free barrier layer.

With respect to claim 43, the substantially dopant-free barrier layer of Tada comprises silicon nitride.

With respect to claim 44, the at least one first doped area of Tada comprises a p-type impurity (2) and the at least second, differently doped area comprises an n-type impurity.

With respect to claim 45, the at least one first doped area of Tada comprises an n-type impurity (2) and the at least second, differently doped area comprises a p-type impurity.

9. Claims 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tada '577 in view of Koike '325.

Tada teaches a pre-anneal intermediate structure in the formation of an isolation structure (9) for a semiconductor device substantially as claimed including:

a semiconductor substrate (100) free of field oxide structures and includes a first surface and a second surface, the first surface opposing the second surface;

at least one p-well (3) and at least one n-well (2) defined on the substrate first surface;

at least one p-type area (5) defined within the at least one n-well;

at least one n-type area (6) defined within the at least one p-well; and

a substantially dopant-free, uninterrupted diffusion barrier layer extending over the substrate first surface. (See Fig. 2c, col. 6, ll. 3-32).

Thus, Tada is shown to teach all of the features of the claim with the exception of the substantially dopant-free barrier layer is formed extending over the substrate second surface.

However, Koike teaches a substantially dopant-free, uninterrupted barrier layer (104) is formed extending over the substrate (101) first and second surface. (see Fig. 11).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to form the substantially dopant-free barrier layer of Tada extending over the first and second surface as taught by Koike to prevent the second surface from oxidizing.

Further, the pre-anneal intermediate semiconductor substrate of Tada appears to be free of field oxide structures. (See Fig. 2c).

Furthermore, it appears that the substantially dopant-free, uninterrupted barrier layer (104) of Koike are formed on both side of the semiconductor substrate (101) thus meet the limitation of "encapsulating".

With respect to claim 47, the pre-anneal intermediate structure of Tada also includes an oxide layer (4) between the substrate first surface and the substantially dopant-free uninterrupted diffusion barrier layer.

With respect to claim 48, the substantially dopant-free uninterrupted diffusion barrier layer of Tada comprises silicon nitride.

10. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tada '577 and Koike '325 as applied to claim 46 above, and further in view of Shim '596.

Tada and Koike teach all of the features of the claim with the exception of using silicon oxynitride as a material for the substantially dopant-free barrier layer.

However, Shim teaches the oxidation resistant layer (130) comprising silicon oxynitride. (See col. 3, ll. 18-20).

It would have been obvious to one having ordinary skill in the art at the time of the invention to form the substantially dopant-free, uninterrupted diffusion barrier layer of Tada using silicon oxynitride as taught by Shim because it has an added advantage of oxidation resistance.

***Response to Arguments***

11. Applicant's arguments filed November 28, 2000 have been fully considered but they are not persuasive.

With respect to the Notice of Non-Compliant, the Notice was given because it was shown in the amendment filed November 28, 2000 as "(Three time amended)" while the Response filed April 12, 2001 indicated as "(Four time amended)".

**Regarding the Objections:**

Applicant appears to contend that the newly added "free of field oxide" is fully supported by the as-filed specification. However, applicant fails to clearly show whether explicitly or implicitly where in the specification supports the "free of field oxide". *Any negative limitation or exclusionary proviso must have basis in the original disclosure.* See *Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983) aff'd mem., 738 F.2d 453 (Fed.Cir. 1984).

The objection, therefore, maintained.

Regarding 35 USC § 112, first paragraph:

Applicant contends that “free of field oxide” is set forth in both the figures and the “Detailed Description of the Preferred Embodiments”. However, after carefully review the originally filed specification, the term “free of field oxide” was not found. MPEP 2173.05(i) regarding Negative Limitations indicates: “Any claim containing a negative limitation which does not have basis in the original disclosure should be rejected under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement.

The rejection under 35 USC § 112, first paragraph, therefore, maintained.

Regarding 35 USC § 103(a):

With respect to “a semiconductor substrate that is free of field oxide structures”, the new matter has been discussed above. Therefore, further discussion of the new matter is not warranted. Furthermore, the pre-anneal intermediate structure of Tada is clearly free of field oxide structures. (See Fig. 2c).

Applicant appears to contend that since Tada forms the substantially dopant-free, uninterrupted diffusion barrier layer on the first surface but does not *extends over the second surface* thus, Tada does not contemplate the use of such a structure.

To establish a *prima facie* case of obviousness three basic criteria must be meet.

First, suggestion or motivation, Tada forms every elements of the device including the dopant-free barrier layer over the first surface *but does not explicitly* show the dopant-free barrier that extends to the second surface. However, Koike teaches forming the dopant-free

barrier over both the first and the second surface. And the motivation is to prevent oxidizing, one characteristic of nitride, the second surface.

Second, reasonable expectation of success, deposition of a silicon nitride layer is well known in the art and clearly teaches by Koike that forming a layer on first surface consequently forming that layer extending to the second surface. (See Figs. 1 and 11, col. 2, ll. 10-11).

Third, teach or suggest all the claim limitations, all limitations are taught by the combine references.

All three criteria are fulfilled, the *prima facie* case of obviousness has been established.

Subject Matter Recited in Pending Claims

Through a lengthy statement, applicant fails to clearly point out which limitation was not shown in the combination of the references.

Applicant emphasizes the important of the substantially dopant-free, uninterrupted diffusion barrier layer in the pre-anneal intermediate structures. However, the nitride barrier layer in the pre-anneal intermediate structures of Tada is clearly substantially dopant-free, uninterrupted as deposited because the nitride layer is deposited after all of the doping had already been formed.

The References cited in the Final Office Action

The statement "*The combined teaching of Tada and Koike do not establish the prima facie obviousness of claims 25, 26 and 31*" is merely an applicant's conclusion and it is not a fact. The *prima facie* case of obviousness has been discussed and established above.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the issues of field oxide encroachment or dopant contamination of process machinery) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Further, both nitride barrier layer of Tada and Koike are *substantially dopant-free* since none of them are used as a dopant mask. They are formed for one purpose only. It is to form field oxide.

The teaching of both references are clear and the motivation to combine has clearly been discussed above.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant's statement that Koike teaches away from the intermediate structures is merely an applicant's opinion and it is not a fact. The nitride barrier layer of Koike and Tada are substantially dopant-free and are formed for a similar purpose. Beside, it is clearly discussed in the rejection that Koike is cited to show that it is within the ability of one having ordinary skill in the art to extend the substantially dopant-free diffusion barrier layer of Tada over the second surface as taught by Koike and the motivation is to prevent the second surface from oxidizing. Therefore, the combination of the references teach all the limitations of claims 25, 26 and 31.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

With respect to claim 32, as discussed above, Tada and Koike teach all of the features of the claim with the exception of using silicon oxynitride for the diffusion layer. The teaching of Shim includes using silicon oxynitride as the oxidation mask layer. It is very clear that the use of silicon oxynitride in place of silicon nitride is merely an obvious design choice since both materials serve a similar purpose, oxidation mask.

With respect to claims 33, 34, 37 and 38, the subject matter of these claims are similar to that of claims 25, 26 and 31, thus further discussion is not warranted.

With respect to claims 39, 40 and 43-45, again, the subject matter is similar to claims 25, 26 and 31.

With respect to claim 46-48, again, the subject matter is similar to claims 25, 26 and 31.

With respect to claim 49, the similar discussion as that of claim 32, above, applies.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A.M  
July 18, 2001



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